Table 2 Group results at top walking speed (TWS)

Subject	Control	UKA	TKA	OA
Speed (km/h)	7.37 ± 0.68	6.95 ± 0.63	6.11 ± 0.76$\psi\phi$	4.86 ± 0.77ϕ
Cadence (step/min)	140 ± 13	133 ± 16	132 ± 8	120 ± 11ϕ
Stride length (cm)	191 ± 17	189 ± 29	170 ± 21$\psi\phi$	152 ± 22ϕ
Impulse (BW/s)	0.45 ± 0.05	0.45 ± 0.03	0.47 ± 0.03$\psi\phi$	0.50 ± 0.05ϕ
Heel strike (BW)	1.56 ± 0.13	1.52 ± 0.11	1.38 ± 0.18$\psi\phi$	1.19 ± 0.15ϕ

Values indicated as means ± SD

BW body weight normalised

ψ Significance between implant versus controls and ϕ implant versus implant ($P < 0.05$); ϕ significance between all groups ($P < 0.05$)

were subjects of the above mentioned surgeons. After consent each subject was allowed a 6 min acclimatisation period at 4 km/h. Once habituated without safety rail aid, the speed was increased incrementally until top walking speed (TWS) had deteriorated. At all increments, kinematic measurements were collected for both limbs. All variables for each group were compared to each other using an ANOVA with post hoc Tukey with significance set at $\alpha = 0.05$.

Results: The 3 groups were well matched (Table 1). The OKS were higher in the UKA group ($p < 0.01$). At TWS, both arthroplasty groups were significantly better than the OA group (Table 2). Furthermore it was the UKA group which outperformed its rival by walking significantly faster (Table 2). The 11% difference in speed appeared to be due to significant increase in stride length; moreover the UKA group had closer to normal function, nearly matching all control gait parameters and were able to unsparingly load at heel strike, unlike the TKA (Table 2).

Conclusions: By allowing patients to achieve their TWS on an uninterrupted walking platform, we were able to show patients walking substantially faster than any previously reported series in a conventional gait laboratory, yet still UKA walking 11% faster and more normal. This is not randomised data so conclusions must be made with caution but with similar demographics, it appears that UKA may have some advantage over TKA.

FP26-1049

Factors affecting the postoperative limb alignment and clinical outcome after Oxford unicompartmental knee arthroplasty

J.H. Bae[1], S.J. Kim[2], H.C. Lim[2], J.M. Lee[1], J.H. Hong[2]

[1]Korea University Ansan Hospital, Department of Orthopaedic Surgery, Ansan, Republic of Korea, [2]Korea University Guro Hospital, Department of Orthopaedic Surgery, Seoul, Republic of Korea

Objectives: We have specifically investigated the factors affecting the postoperative alignment after Oxford medial UKA. The hypothesis was that mechanical axis deviation (MAD) and TFA would significantly be changed according to the thickness of meniscal bearing, tibia component and femoral component position.

Methods: We retrospectively reviewed 104 patients (124 knees) who underwent Oxford medial UKAs and who were available for follow-up for more than 4 years. There were 20 men and 84 women with a mean weight of 79.5 kg (51.2–97.7 kg). Mean age of the patients was 66.8 (49–79 years) and mean duration for follow-up was 6.7 years (4.2–9.1 years). We measured mechanical axis deviation (MAD), tibiofemoral angle (TFA), tibia component position, femoral componenet position using PACS. Radiologic assessment of arthritis was performed according to Kellgren-Lawrence (K-L) grade. The Knee Society scoring instrument (KSS) was used to assess the clinical outcome. Multiple linear regression analysis was used to determine differences in alignment of the knee among outcome measures, while adjusting for any confounding effect of age, weight and gender. Three separate regression analyses were performed. The dependent variables in the analyses were the amount of correction of MAD (correction amount of zone) and TFA. Independent variables included thickness of bearing, tibial resection angle and femoral component position.

Results: The overall changes in MAD (chages in zone) and TFA were significantly different according to bearing size ($P = 0.001$ and <0.001). There were no significant changes in MAD and TFA according to the tibia component and femoral component position. Postoperatively, 108 (87%) of the 124 knees had the mechanical axis crossing through the intercondylar notch of the tibia (zone C) and zone 2. 16 knees (13%) had the axis crossing the lateral 50% of the proximal aspect of the tibia (zones 3 and 4) and among these 16 knees, there was progression of arthritic change of lateral compartment from preoperative K-L grade 1 to postoperative K-L grade 2 in 10 knees, and preoperative K-L grade 1 to postoperative K-L grade 3 in 4 knees. 108 knees, which had the mechanical axis passing the zone C or zone 2, didn't show any change in the Kellgren-Lawrence grade. However, there were no significant differences of KSS according to postoperaive limb alignment (MAD).

Conclusions: Postoperative limb alignment after Oxford medial UKA can be affected by thickness of bearing size (maybe overriding effect). The effect of tibia component and position of femoral component was not significant.

FP26-1165

In vitro knee kinematics of unicondylar knee arthroplasty

T.J. Heyse[1], B.F. El-Zayat[1], Y. Chevalier[2], S. Fuchs-Winkelmann[1], L. Labey[2]

[1]Universitätsklinikum Gießen und Marburg, Standort Marburg, Klinik für Orthopädie und Rheumatologie, Marburg, Germany, [2]Smith and Nephew, European Centre for Knee Research, Leuven, Belgium

Objectives: The last years have deepened the knowledge of kinematics before and after implantation of total knee arthroplasty (TKA). For unicondylar knee arthroplasty (UKA), functional results described in clinical studies suggest kinematics closer to the natural knee, but few biomechanical studies support and explain these findings. This study aims at testing the claim by comparing in vitro knee kinematics before and after UKA.

Methods: Frames with reflective markers were rigidly fixed to tibia, femur and patella of six fresh frozen full leg cadaver specimens and a computed tomography (CT) scan was made. Femur and tibia were embedded, properly aligned in frontal and sagittal planes. The medial and lateral hamstrings tendons were prepared for attachment to constant load springs (50 N each). The quadriceps tendon was prepared to be clamped to a motor. The knees were mounted in a kinematic rig that provides six degrees of freedom to the knee joint. Infrared cameras continuously recorded the trajectories of the markers.

The specimens were subjected to three motion patterns: a passive motion cycle, an open chain extension with 3 kg of load hung to the distal tibia, and a squat between 30° and 120° of flexion with a constant vertical ankle force of 130 N. Based on the CT, models of tibia and femur were made and bony landmarks identified to determine coordinate frames for both bones. The marker trajectories were transformed to anatomical meaningful rotations and translations according to Grood and Suntay. Tibial axial rotation and ab-adduction, and translations in antero-posterior and medio-lateral direction, were obtained as a function of flexion angle.

After testing the native knee, a medial UKA (Accuris UKA system from Smith & Nephew, Memphis, TN, USA) was performed and the same tests were redone.

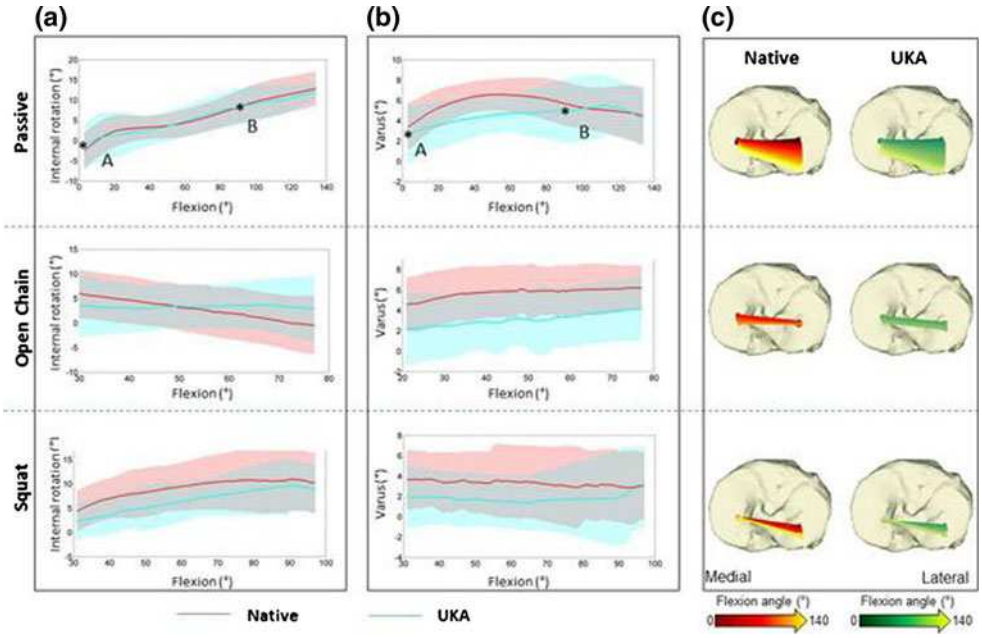
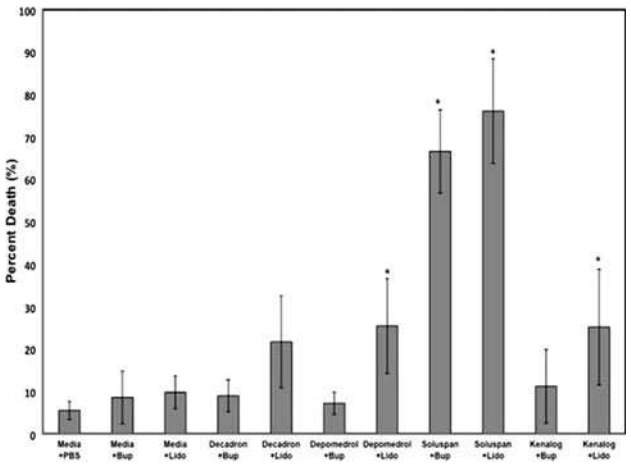


Fig. 1 Average pre- and post-UKA in vitro kinematics for passive, open chain and squat motion tests: ***a*** *tibial internal rotation;* ***b*** *tibial adduction and* ***c*** *rollback behavior showed similar trends before and after UKA. Points* A *and* B *shown for passive motion represent knee balancing at 0 and 90°, respectively*

Results: Tibial ab- and adduction at 0° and 90° shows that the knees were well balanced after UKA (Fig. 1a). Tibial axial rotation and ab-adduction during motion were respectively within 5° and 2° from the native kinematics patterns. A slight reduction in adduction during loaded motor tasks was observed due to the stiffer medial condyle after UKA (Fig. 1b). Rollback behavior in every motion test was also conserved after UKA, as can be observed from the projected displacements of the femoral condyle centers (Fig. 1c).
Conclusions: Our in vitro biomechanical results suggest that UKA knee kinematics are generally close to native knee kinematics in a variety of loading regimes. A slight reduction of internal tibial rotation and adduction with flexion in loaded situations may be due to a stiffer medial contact.

Mechanobiolology of the knee

FP27-116
The effect of local anesthetic and corticosteroid combinations on chondrocyte viability
H.J. Braun[1], *N. Wilcox-Fogel*[1], *H.J. Kim*[1], *M.A. Pouliot*[1], *A. Sox-Harris*[1], *J.L. Dragoo*[1]
[1]Stanford University, Orthopaedic Surgery, Redwood City, United States
Objectives: Local anesthetic and corticosteroid combination injections are often used in clinical practice, but research investigating the chondrotoxic properties of these combinations is minimal. The purpose of this study was to evaluate the effect of single injection doses of 1% lidocaine or 0.25% bupivacaine in combination with single injection doses of Dexamethasone sodium phosphate (Decadron®), Methylprednisolone acetate (Depo-Medrol®), Betamethasone sodium phosphate and Betamethasone acetate (Celestone® Soluspan®), or Triamcinolone acetonide (Kenalog®) on human chondrocyte viability.
Methods: Human chondrocytes were seeded at a density of 0.5×10^6 cells/well. All medications were delivered to human chondrocytes in vitro for the medication's respective average duration of action using a bioreactor containing a continuous infusion pump constructed to mimic joint fluid metabolism. A two-color fluorescence assay was used to evaluate cell viability. A mixed-effects regression model was used to evaluate the mean differences in cell viability between treatment groups.
Results: At 14 days, chondrocytes treated with 1% lidocaine and Betamethasone sodium phosphate and Betamethasone acetate illustrated a dramatic decrease in viability (76.08 ± 12.32% death) compared with control media (5.51 ± 2.13% cell death, $p < 0.01$), 1% lidocaine alone (9.77 ± 3.8% $p < 0.01$), and 0.25% bupivacaine alone (8.56 ± 6.23% cell death, $p < 0.01$). Cultures of 0.25% bupivacaine and Betamethasone sodium phosphate and Betamethasone were similarly chondrotoxic (66.57 ± 9.82% cell death; $p < 0.01$) compared to controls. Compared with 1% lidocaine alone (9.77 ± 3.8% cell death), both 1% lidocaine and Methylprednisolone acetate (25.4 ± 11.2%, $p < 0.013$) and 1% lidocaine and Triamcinolone acetonide (25.2 ± 13.6%, $p < 0.016$) also illustrated significant chondrotoxic effects.



Chondrocyte viability